

FORM PTO-1390 (REV 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEYS DOCKET NUMBER 041618-0071
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) Not Yet Assigned 10/089566
INTERNATIONAL APPLICATION NO. PCT/GB00/03872	INTERNATIONAL FILING DATE October 9, 2000	PRIORITY DATE CLAIMED October 8, 1999	
TITLE OF INVENTION VEHICLE AIR BRAKING SYSTEMS			
APPLICANT(S) FOR DO/EO/US Philip TONKIN			
<p>Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. <input checked="" type="checkbox"/> This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)). <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (PCT Article 31). <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) (WO 01/26947 A1 filed October 9, 2000) <ol style="list-style-type: none"> <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). <input type="checkbox"/> has been communicated by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). <ol style="list-style-type: none"> <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). <input type="checkbox"/> have been communicated by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input type="checkbox"/> have not been made and will not be made. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). <p>Items 11 to 20 below concern document(s) or information included:</p> <ol style="list-style-type: none"> <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. <input type="checkbox"/> A substitute specification. <input type="checkbox"/> A change of power of attorney and/or address letter. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). <input checked="" type="checkbox"/> Other items or information: <ol style="list-style-type: none"> International Preliminary Examination Report (PCT/IPEA/409) International Search Report (PCT/ISA/210) One (1) Sheet of Drawings (Fig. 1) Application Data Sheet 			

U.S. APPLICATION NO (If known, see 37 C.F.R. 1.50) Not Yet Assigned 107089566		INTERNATIONAL APPLICATION NO PCT/GB00/03872		ATTORNEYS DOCKET NUMBER 041618-0071	
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21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a)(1) – (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1040.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... \$890.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(3)) paid to USPTO \$740.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00				\$890.00			
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$890.00			
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(c))				\$130.00			
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE				
Total claims	10 - 20 =	0	X \$18.00	\$ -----			
Independent claims	2 - 3 =	0	X \$84.00	\$ -----			
MULTIPLE DEPENDENT CLAIM(S) (if applicable) Yes			+ \$280.00	\$ 280.00			
TOTAL OF ABOVE CALCULATIONS =				\$ 1300.00			
<input type="checkbox"/> Applicant claims small entity status See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$			
SUBTOTAL =				\$1300.00			
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f))				\$-----			
TOTAL NATIONAL FEE =				\$1300.00			
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$-----			
TOTAL FEES ENCLOSED =				\$1300.00			
				Amount to be refunded:			
				\$			
				charged:			
				\$			

a. ☒ A check in the amount of **\$1300.00** to cover the above fees is enclosed

b. ☐ Please charge my Deposit Account No. 19-2380 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-2380(041618-0071). A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

NIXON PEABODY LLP 8180 Greensboro Drive Suite 800 McLean, Virginia 22102	 _____ Jeffrey L. Costellia NAME #35,483 REGISTRATION NUMBER JLC/sas April 2, 2002
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10/089566

041618-0071
JC13 Rec'd PCT/PTO 02 APR 2002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re **NATIONAL PHASE** Application of)
Philip TONKIN) Attn: US/DO/EO
International Application No. PCT/GB00/03872)
International Filing Date: October 9, 2000)
For: **VEHICLE AIR BRAKING SYSTEMS**) Date: April 2, 2002

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Please preliminarily amend the subject application as follows:

IN THE CLAIMS:

Please note, the amended claims are presented below in their amended form. Further, as an Attachment to the Amendment the amendments to the claims are outlined using the conventional method of bracketing and underlining.

Please amend the following claims:

5. **(AMENDED)** A system according to claim 1 wherein said control means is responsive to a state of the vehicle ignition system.
6. **(AMENDED)** A system according to claim 1 wherein the control valve is switchable between an inlet position, where air received at an inlet thereof passes to the reservoir via the desiccant, and an exhaust position where air in the reservoir is permitted to flow through the desiccant and control valve vent to atmosphere.

7. **(AMENDED)** A system as claimed in claim 1 wherein the control valve and vent are provided in a common housing of the air dryer.
8. **(AMENDED)** A system as claimed in claim 1 wherein the control valve is intermediate a desiccant chamber of the air dryer and the vent.
9. **(AMENDED)** A system as claimed in claim 1 wherein the reservoir surrounds the air dryer.

041618-71

REMARKS

It is respectfully requested that the foregoing amendments be entered and fully considered by the Examiner prior to examination of the subject application on the merits.

The claims have been amended to correct the improper multiple dependencies in order to place them in better condition for examination.

Examination on the merits is requested.

Respectfully submitted,



 Jeffrey L. Costellia
 Registration No. 35,483

NIXON PEABODY LLP
 8180 Greensboro Drive, Suite 800
 McLean, Virginia 22102
 (703) 790-9110

JLC/sas

Please amend the following claims:

5. **(AMENDED)** A system according to [any preceding] claim 1 wherein said control means is responsive to a state of the vehicle ignition system.
6. **(AMENDED)** A system according to [any preceding] claim 1 wherein the control valve is switchable between an inlet position, where air received at an inlet thereof passes to the reservoir via the desiccant, and an exhaust position where air in the reservoir is permitted to flow through the desiccant and control valve vent to atmosphere.
7. **(AMENDED)** A system as claimed in [any preceding] claim 1 wherein the control valve and vent are provided in a common housing of the air dryer.
8. **(AMENDED)** A system as claimed in [any preceding] claim 1 wherein the control valve is intermediate a desiccant chamber of the air dryer and the vent.
9. **(AMENDED)** A system as claimed in [any preceding] claim 1 wherein the reservoir surrounds the air dryer.

i/p r/b

VEHICLE AIR BRAKING SYSTEMS

The present invention relates to vehicle air braking systems, and particularly to the removal of moisture from such systems.

A typical air braking system includes a compressor, an air dryer for compressor outlet air and a reservoir for pressurised air. The compressor output is directed via a non-return valve through the air dryer to the reservoir. The reservoir may comprises a purge volume and a service volume separated by a non return valve. Periodically dry air from the purge volume is directed back through the air dryer (which typically includes a bed of desiccant material) in order to purge the majority of moisture therefrom. Purging may be controlled by, for example a timer, and can occur after the compressor has been off load for a predetermined time.

It is important that moisture is periodically removed from the air dryer so as to prevent degradation of the desiccant bed, and corrosion of the air dryer and other components and conduits of the braking system. In periods of cold weather it is possible that moisture present in an air dryer overnight can freeze with the consequence that operation of the air dryer is impeded and/or the air dryer is damaged and/or the braking system rendered inoperable.

As described above, purging occurs after the compressor has been off load for a predetermined time. This presents a problems when purging the air dryer before a vehicle ceases to be used, for example when it is parked overnight. In bringing the vehicle to a standstill air is expended from the reservoir, and the resulting drop in reservoir pressure can bring the compressor on-load to replenish the reservoir. As a purge of the air dryer cannot be carried out while the compressor is on-load, the vehicle engine must be run until the compressor goes off-load before the air dryer can be purged. Consequently a vehicle driver must remain in the vehicle with the engine running until the reservoir is replenished. Such a procedure is both wasteful of the driver's time and vehicle fuel, and thus often the system is not purged at the end of the working day, as would be desirable.

According to the present invention there is provided a vehicle air braking system including an air compressor, an air dryer, an air dryer control valve having a vent to atmosphere, a reservoir adapted to contain a quantity of dry air for use in regenerating desiccant of the air dryer and means to exhaust the dry air through the desiccant and control valve to atmosphere, the system further including control means sensitive to the operating condition of the vehicle and operable to cause regeneration of the desiccant and purging of the control valve when the vehicle engine is stopped.

The control means of the present invention sense when operation of the vehicle ceases, for example when it is parked, and automatically regenerates the desiccant to remove moisture therein. This eliminates the need for the driver of the vehicle to keep the engine running and wait for the compressor to go off load. By regenerating the desiccant automatically on vehicle shutdown, the possibility that the desiccant may be damaged by the freezing of moisture therein is reduced. Moisture which may be present in venting ducts, control valve passageways or in the air dryer body is also expelled, which reduces the possibility of the subsequent operation of the venting system being hampered or prevented by ice.

A further advantage of the invention is that automatic regeneration at the end of the working day necessarily leaves the desiccant in a dry condition. In turn this can reduce the time to pump up the system on the following day since an intermediate regeneration might be avoided. Such an intermediate regeneration would interrupt charging if the air dryer remained in a relatively wet condition at the end of the previous working day, and become saturated part way through initial charging. Intermediate regeneration could be triggered by for example moisture sensing or the sensing of volume pumped since the previous regeneration.

In a preferred embodiment the control means are operable to open the control valve vent of the air braking system, and preferably to close the vent once regeneration has taken place. Closure of the vent isolates the control valve and desiccant from atmosphere and prevents the ingress of matter such as dust and insects, and further prevents degradation of the desiccant via moisture in the ambient atmosphere. The control means may be responsive to the state of the vehicle ignition system. The vent may open against a resilient bias and thus automatically return to the closed condition after regeneration. Such an arrangement

Preferably the control valve is switchable between an inlet position, where air received at an inlet thereof passes to the reservoir via the desiccant, and an exhaust position where air in the reservoir is permitted to flow through the desiccant and control valve vent to atmosphere. The control valve can thus be used for both periodic regeneration of the desiccant when the vehicle is in use and purging of the system at the end of the working day. In a preferred embodiment the control valve and vent are provided in a common housing of the air dryer. It will be appreciated that that such an arrangement eliminates the need for additional piping to be provided between control valve, vent and air dryer which reduces the size of the system and complexity. By positioning the control valve is intermediate a desiccant chamber of the air dryer and the vent, it is ensured that the control valve is purged of any moisture contained therein. In a preferred embodiment the reservoir surrounds the air dryer.

determining that the vehicle engine is stopped;
connecting a regeneration reservoir of dry air to the air dryer;
connecting the air dryer and control valve to atmosphere; and
backflushing the air dryer and control valve to remove moisture therefrom.

An embodiment of the present invention will now be described with reference to the accompanying drawing (Figure 1) which shows cross sectional representation of combined reservoir and dryer assembly according to the present invention.

The assembly, generally designated 10, comprises an airtight container 12 having an inlet 14 and an outlet 16. The inlet 14 is closed by a control valve 18. The outlet 16 is closable

in use by a demand valve of the air braking system (not shown) within which the component is incorporated. The container 12 is provided with an internal partition 20 dividing the interior thereof into two chambers; a service chamber 22 and a purge chamber 24. A non-return valve 26 of the partition 20 permits one way fluid communication from the purge chamber 24 to the service chamber 22.

A desiccant compartment 28 is located downstream of the inlet 14 within the purge chamber 24. A passageway 30 having a non-return valve 32 is arranged between the desiccant compartment 28 and the purge chamber 24. The non-return valve 32 is arranged such that air can pass from the inlet 14 through the desiccant compartment 28 and into the purge chamber 24 but not in the reverse direction. The desiccant compartment 28 is further provided with a second passageway 34 with a restriction 36 therein.

The control valve 18 is switchable between an inlet position and an exhaust position. The inlet position permits air received from the inlet to pass first into the purge chamber 24 via the desiccant compartment 28 and thereafter to the service chamber 22 via the non-return valve 26. The exhaust position of the control valve 18 permits air in the purge chamber 24 to flow through the desiccant compartment 28 and out to atmosphere via a vent 38 in the control valve housing.

The control valve 18 is connected to a controller 40 which under normal operating conditions periodically moves the control valve 18 to the exhaust position to permit regeneration of the desiccant in the desiccant chamber 28 by the dry air in the purge chamber 24. The controller is sensitive to the condition of the compressor (not shown) so that regeneration will not take place when the compressor is on load. According to the present invention the controller 40 is also operable so as to move the control valve 18 to the exhaust position when use of the vehicle ceases. For example, the controller may be sensitive to the vehicle's ignition system such that when the ignition system is switched off the control valve moves to the exhaust position and the desiccant is regenerated. The control valve 18 then reverts to the inlet position ready to receive air from the compressor when the vehicle is reactivated.

Claims

1. A vehicle air braking system including an air compressor, an air dryer, an air dryer control valve having a vent to atmosphere, a reservoir adapted to contain a quantity of dry air for use in regenerating desiccant of the air dryer and means to exhaust dry air through the desiccant and control valve to atmosphere, the system further including control means sensitive to the operating condition of the vehicle and operable to cause regeneration of the desiccant and purging of the control valve when the vehicle engine is stopped.
2. A system according to claim 1 wherein said control means are operable to opens and vent of the control valve.
3. A system according to claim 2 wherein said control means are operable to close said vent after regeneration.
4. A system according to claim 2 or claim 3 wherein said control valve is a valve operated by a solenoid.
5. A system according to any preceding claim wherein said control means is responsive to a state of the vehicle ignition system.
6. A system according to any preceding claim wherein the control valve is switchable between an inlet position, where air received at an inlet thereof passes to the reservoir via the desiccant, and an exhaust position where air in the reservoir is permitted to flow through the desiccant and control valve vent to atmosphere.
7. A system as claimed in any preceding claim wherein the control valve and vent are provided in a common housing of the air dryer.
8. A system as claimed in any preceding claim wherein the control valve is intermediate a desiccant chamber of the air dryer and the vent.
9. A system as claimed in any preceding claim wherein the reservoir surrounds the air dryer.
10. A method of regenerating an air dryer of a vehicle air braking system and purging a control valve of the air dryer at the end of the working day, the method comprising the steps of:
 - determining that the vehicle engine is stopped;
 - connecting a regeneration reservoir of dry air to the air dryer;
 - connecting the air dryer and control valve to atmosphere; and
 - backflushing the air dryer and control valve to remove moisture therefrom.

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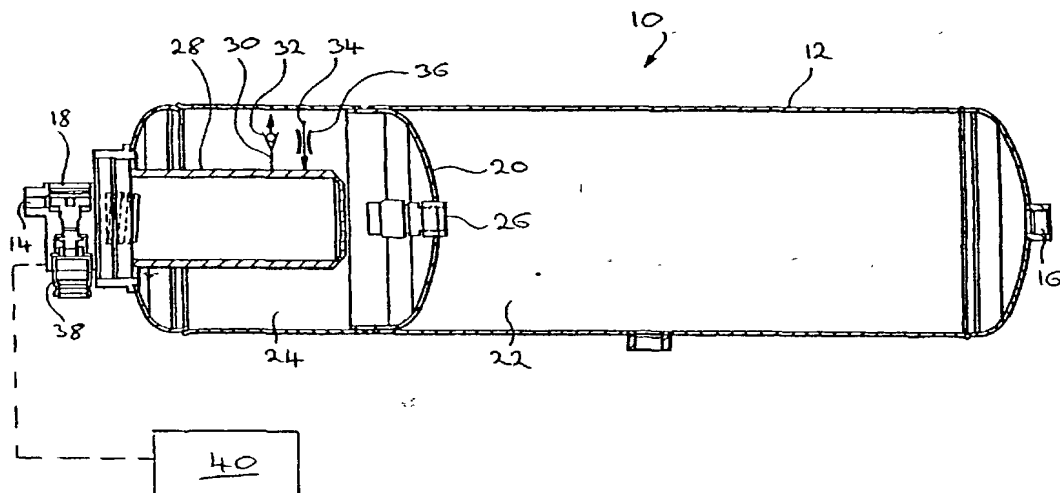
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(72) Inventor; and

(75) Inventor/Applicant (for US only): **TONKIN, Philip**

(54) Title: VEHICLE AIR BRAKING SYSTEMS



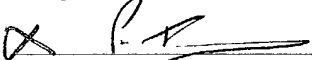

(57) Abstract: A vehicle air braking system including an air compressor, an air dryer, an air dryer control valve (18) having a vent (38) to atmosphere, a reservoir (24) adapted to contain a quantity of dry air for use in regenerating desiccant (28) of the air dryer and means to exhaust dry air through the desiccant (28) and control valve (18) to atmosphere, the system further including control means (40) sensitive to the operating condition of the vehicle and operable to cause regeneration of the desiccant (18) and purging of the control valve (18) when the vehicle engine is stopped.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76) AND POWER OF ATTORNEY

Title of Invention	VEHICLE AIR BREAKING SYSTEMS
<p>As the below named inventor(s), I/we declare that:</p> <p>This declaration is directed to:</p> <p><input checked="" type="checkbox"/> International Application No. <u>PCT/GB00/03872</u>, filed on <u>October 9, 2000</u></p> <p><input checked="" type="checkbox"/> Application No. <u>10/089,566</u>, filed on <u>April 2, 2002</u>,</p> <p><input checked="" type="checkbox"/> as amended on <u>April 2, 2002</u> (if applicable);</p> <p>I/We believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;</p> <p>I/We have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;</p> <p>I/We acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including material information which became available between the filing date of the prior application and the National or PCT International filing date of the continuation-in-part application, if applicable; and</p> <p>All statements made herein of my/own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.</p> <p>I/We hereby appoint:</p> <p>Practitioners at Customer Number <u>22204</u> as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.</p>	

FULL NAME OF INVENTOR(S)		
Inventor one:	<u>Philip TONKIN</u> <u>GBN</u>	Citizen of: <u>Great Britain</u>
Signature:	<u></u>	Date: <u> 27. MAY. 02.</u>
Inventor two:	_____	Citizen of: _____
Signature:	_____	Date: _____
Inventor three:	_____	Citizen of: _____
Signature:	_____	Date: _____
Inventor four:	_____	Citizen of: _____
Signature:	_____	Date: _____

Burden Hour Statement. This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is used by the public to file (and the PTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This form is estimated to take 1 minute to complete. This time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

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Fig. 1

Legal Representative:

Attorney or Agent:

Jeffrey L. Costellia

Registration Number:

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Customer Number Correspondence Address:

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Beacon Works

Morley Leeds LS27 0HQ Great Britain GB

INVENTOR(s):

Primary Citizenship:

Great Britain

Given Name:

Philip

Family Name:

TONKIN

Residence City:

Leeds GB

Residence Country:

GB

Address:

c/o Wabco Automotive (UK) Limited Engineering Division,
Beacon Works

Morley Leeds, LS27 0HQ GB